

ANALYSIS OF DATA FROM THE ENERGETIC GAMMA-RAY
EXPERIMENT TELESCOPE ON THE GAMMA RAY OBSERVATORY

NASA GRANT # NAG 5 1742

Principal Investigator: Donald A Kniffen

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RESEARCH REPORT

(1) SUMMARY

The work under the Grant has involved continued participation with the Compton Gamma Ray Observatory Energetic Gamma-Ray Experiment Telescope (EGRET) Team in the analysis of data obtained during instrument operations and the preparation of scientific papers and proposals for future observations. The Principal Investigator (PI) has been a co-author on a total of thirty-four papers published in refereed professional journals since the beginning of 1993, plus many other non-refereed publications, and contributed and invited papers at professional meetings and IAU telegrams. The EGRET team continues to submit IAU Astronomical telegrams and present many papers at scientific meetings. The EGRET Team was also successful on many proposals for the Cycle 4 portion of the mission, including long high galactic latitude studies of the diffuse extragalactic radiation in both the Northern and Southern Galactic Sky. These studies will be used in a effort to establish whether this radiation is truly diffuse or the sum of radiation from unresolved discrete sources such as radio-loud quasars. The Cycle 4 proposal include the EGRET Team, and Drs. Floyd Stecker, Mike Salamon and John Miller.

The effort by the PI has involved working remotely by internet connection on the Goddard Space Flight Center Computers where the EGRET data are archived. Students have monitored instrument performance, performed Viewing Period Analyses and analyzed data remotely and will continue to do so. The PI has completed the detailed analysis of seven viewing periods to search for point sources and this work has been used in developing the first EGRET catalog of sources, soon to be published in a Supplement to the *Astrophysical Journal*.

During this period the PI visited The Max Planck Institute in Garching, Germany, where he participated in data analysis and an EGRET team meeting. In addition he attended the Marcel Grossmann Meeting at Stanford University in July. He has made

numerous trips to the NASA Goddard Space Flight Center for data analysis and scientific discussions, and has interfaced with two guest investigator activities.

Data analysis is underway for papers on behalf of the EGRET Team by the PI on general sources in the anticenter region of the galaxy, with galactic latitudes from 125° to 220° . A paper on this subject will be prepared for publication in the Astrophysical Journal. Another is being prepared on EGRET observations of the COS-B source 2CG135 and for pulsars from Phase 3.

A number of papers have been published in the last reporting period, and several others are in press currently. A summary of the publications is attached below.

(2) PROGRESS

The progress of major efforts under this grant are given below:

- (a) The PI continues to participate in the preparation of many papers for publication in various journals for astronomy and astrophysics.
- (b) The PI is assisted in the preparation of proposal for the Cycle 4 Compton Observatory data and was PI of a successful proposal entitled "Investigation of the High Latitude Diffuse Gamma-Ray Emission."
- (c) The PI will continue to analyze a portion of the viewing periods for the presence of discrete source with student participation at Hampden-Sydney College.
- (d) The PI is preparing a paper describing the high energy sources observed by EGRET in the galactic plane region $25^\circ \leq \ell \leq 220^\circ$.
- (e) The PI is preparing a paper describing the EGRET high energy gamma-ray observations of the COS-B source 2CG135.
- (f.) The PI is preparing a paper on the contribution of unresolved pulsars to the observed galactic diffuse gamma-radiation with Matthew Bailes and Joe Fierro.
- (f) The PI continues to attend EGRET Team Meetings as possible and works closely with the rest of the EGRET Team on data analysis. He attended the team meeting at the Max-Planck Institute in Garching, Germany, in June.

(3) PUBLICATIONS

The following are articles co-authored by the PI which are related to this work and which have appeared in refereed journals since the inception of this Grant.

1992 "A High Frequency Survey of the Southern Galactic Plane for Pulsars", S. Johnston, A. G. Lyne, R. N. Manchester, D. A. Kniffen, N. D'Amico, J. Lim and M. Ashworth, Monthly Notices of the Royal Astronomical Society **255**, 401.

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1992 "SAS-2 Observation of Pulsed High Energy Gamma Radiation from Geminga," J.R. Mattox, D.L. Bertsch, C.E. Fichtel, R.C. Hartman, D.A. Kniffen, and D.J. Thompson, *Astrophys. J. Letters* **401**, L23.

1992 "Detection of High Energy Gamma-Ray Emission from the BL Lac Object MKN421 by the EGRET Telescope on the Compton Observatory," Y.C. Lin, D.L. Bertsch, J. Chiang, C.E. Fichtel, R.C. Hartman, S.D. Hunter, G. Kanbach, D.A. Kniffen, P.W. Kwok, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **401**, L61.

1992 "EGRET Detection of High Energy Gamma Radiation from the OVV Quasar 3C454.3," R.C. Hartman, D.L. Bertsch, C.E. Fichtel, S.D. Hunter, G. Kanbach, P. Kwok, D.A. Kniffen, Y.C. Lin, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. v.Montigny, P.L. Nolan, K. Pinkau, H. Rothermel, E. Schneid, P. Sreekumar, and D.J. Thompson, *Astrophys. J.* **401**, L61.

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- 1993 "Pulsed High-Energy Gamma Rays from PSR 1055-52," J.M. Fierro, D.L. Bertsch, K.T.S. Brazier, J. Chiang, N. D'Amico, C.E. Fichtel, R.C. Hartman, S.D. Hunter, S. Johnston, G. Kanbach, V.M. Kaspi, D.A. Kniffen, Y.C. Lin, A.G. Lyne, R.N. Manchester, J.R. Mattox, H.A. Mayer-Hasselwander, P.F. Michelson, C. von Montigny, P.L. Nolan, E. Schneid, and D.J. Thompson, *Astrophys. J.* **413**, L27.
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(4) PLANNED ACTIVITIES

In the coming period, several publications will be completed, the PI will continue to analyze EGRET data and viewing periods, and frequent visits will be made to the GSFC for collaboration with the EGRET Co-Investigators. Four papers, currently in progress,

on EGRET results will be completed and submitted for publication. A Cycle IV proposal to the *Compton* Observatory Guest Investigator Program will be prepared and submitted on behalf of the EGRET Team. The GSFC EGRET team will be supported in data reduction and operations activities, and EGRET Team meetings will be attended. Scientific results will be presented at future scientific meetings.